Un-suppressing MI30 Dispersion function for Momentum Scraping

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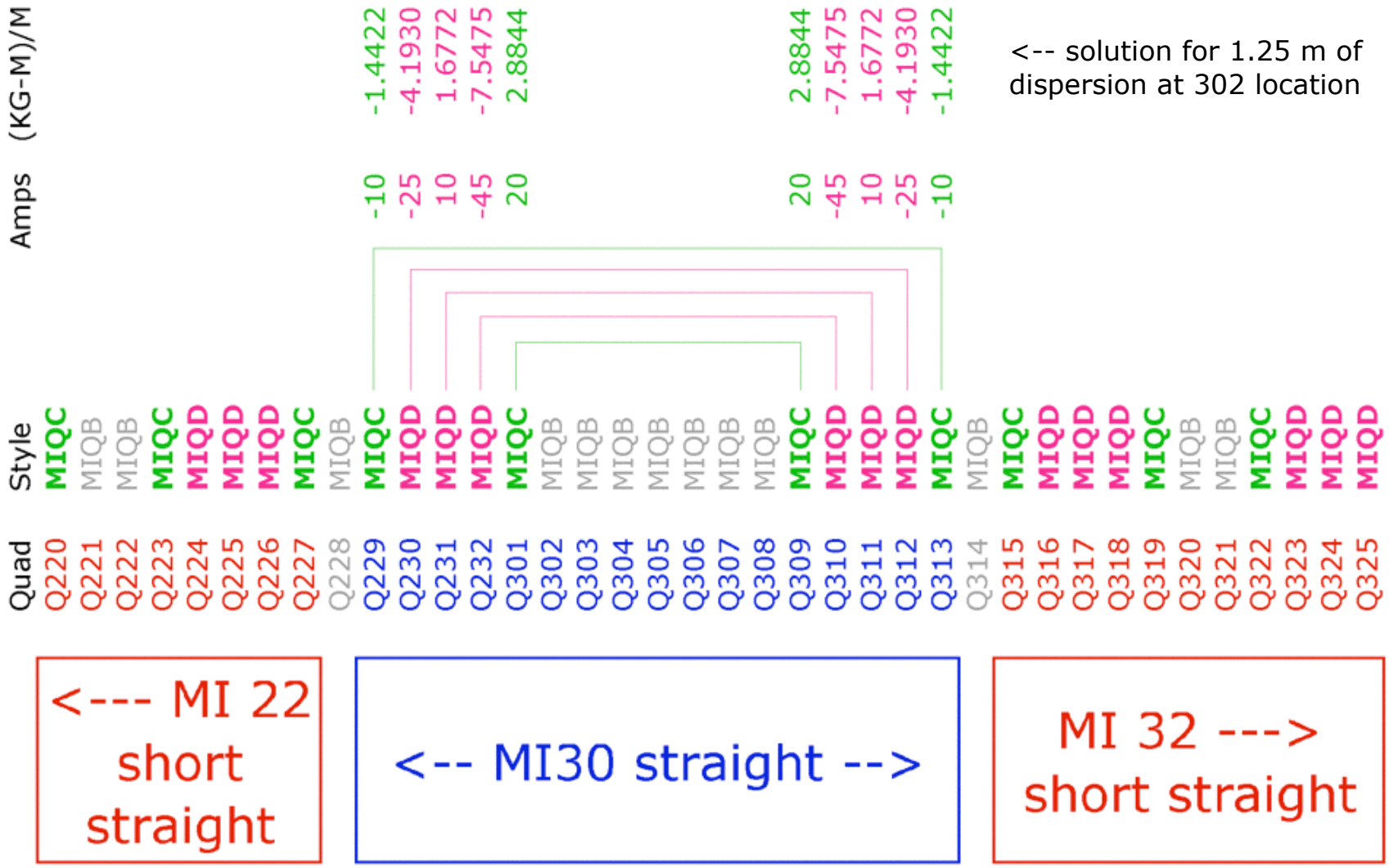
Criteria for a Scraper Location

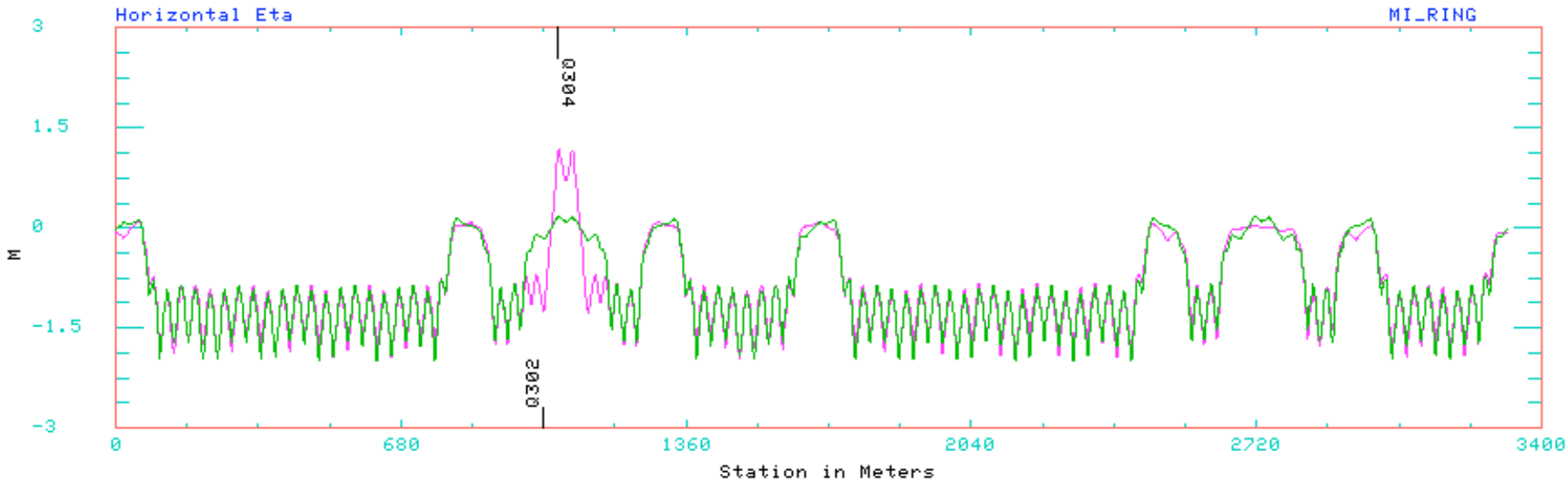
- In the straight section
  - Only from 301 to 305 is available.
- Non-zero Dispersion function.
  - Use trim coils on IQC & IQD.
  - Need power supplies.

MI30 quad configuration

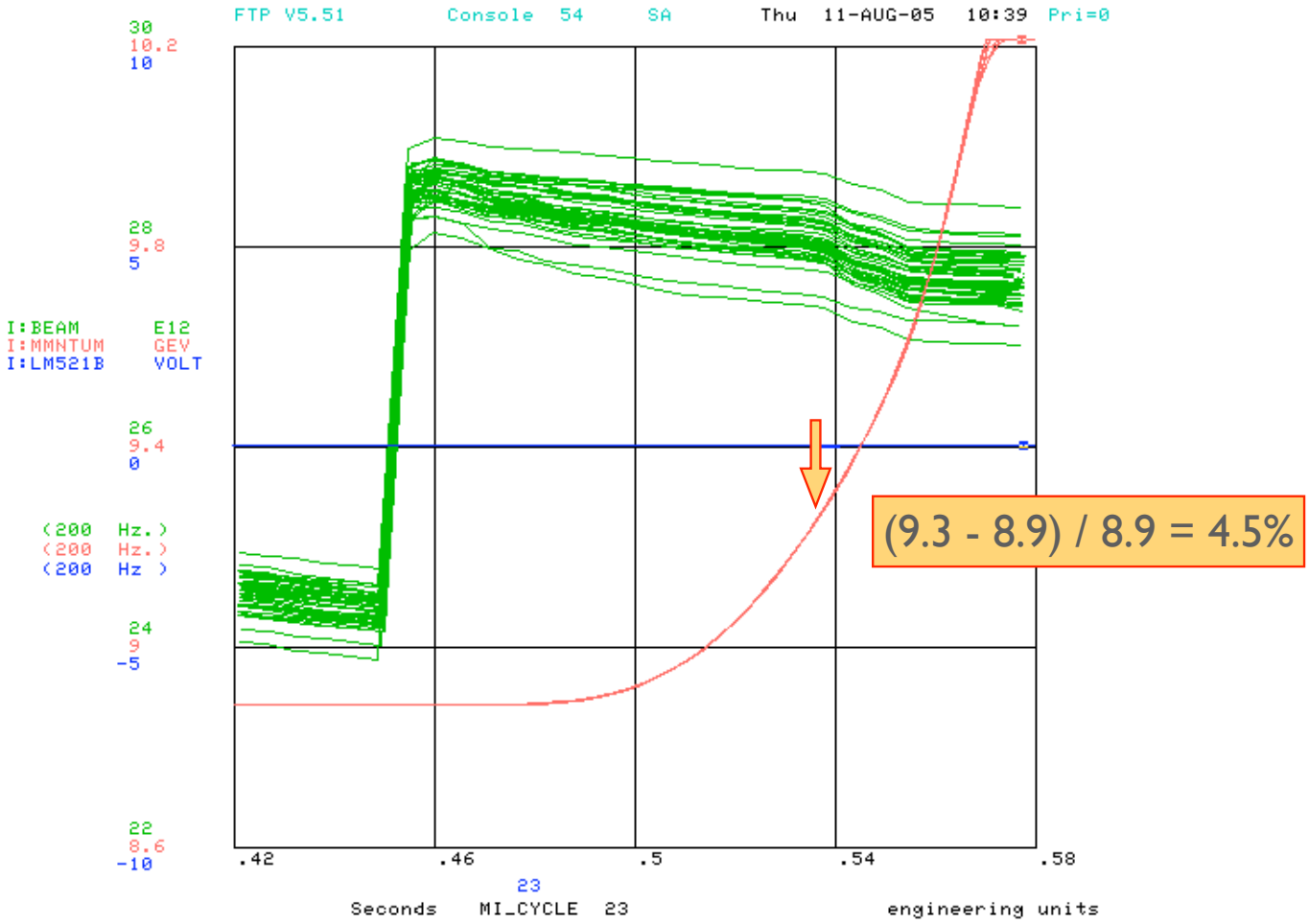


<-- solution for 1.25 m of dispersion at 302 location

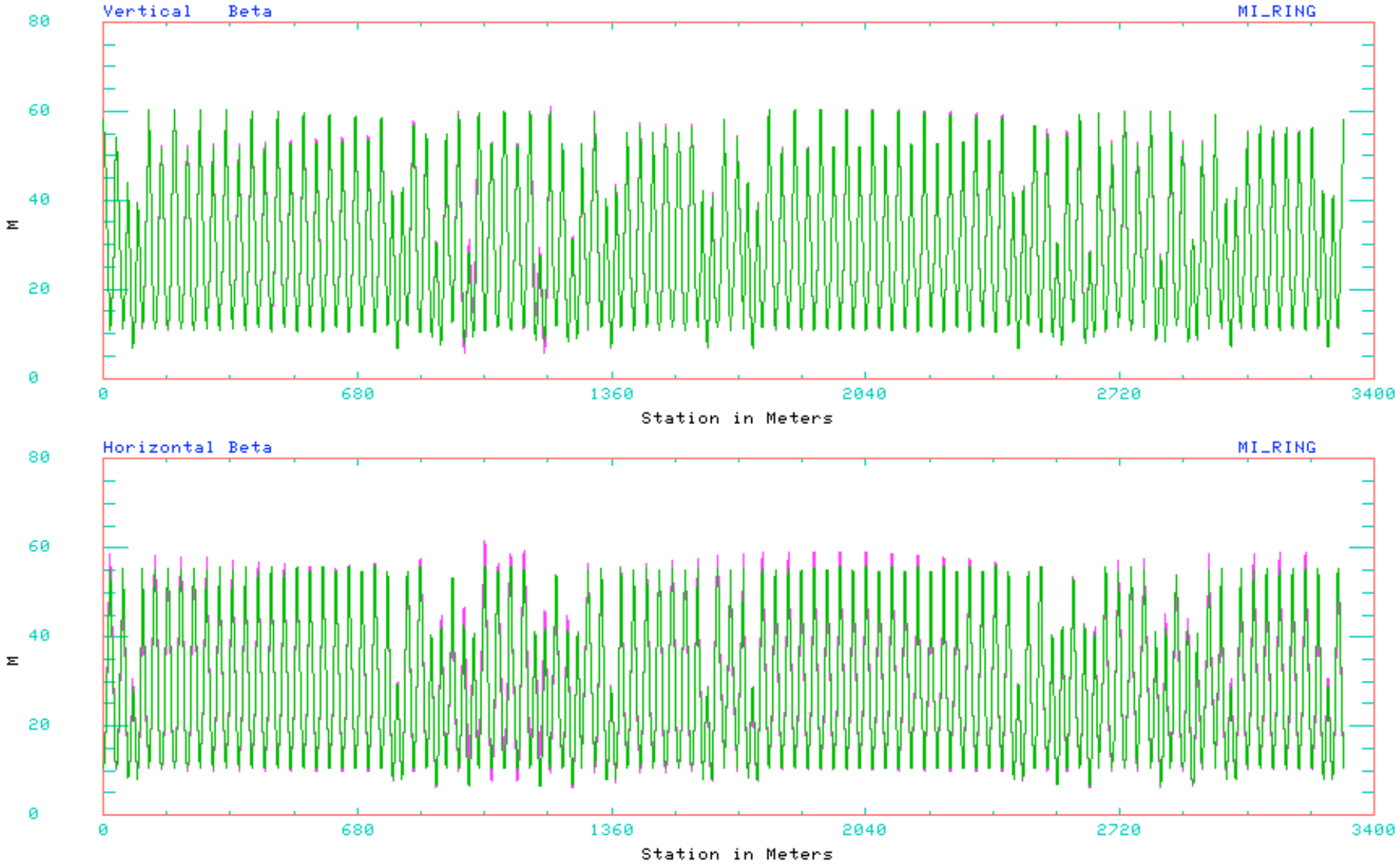
Resulted dispersion function, ring-wide



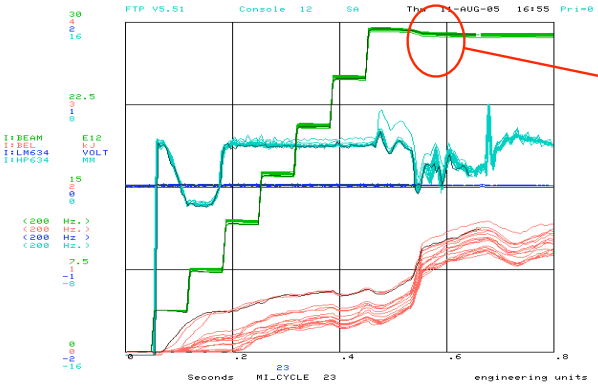
Δp/p of the scraped beam

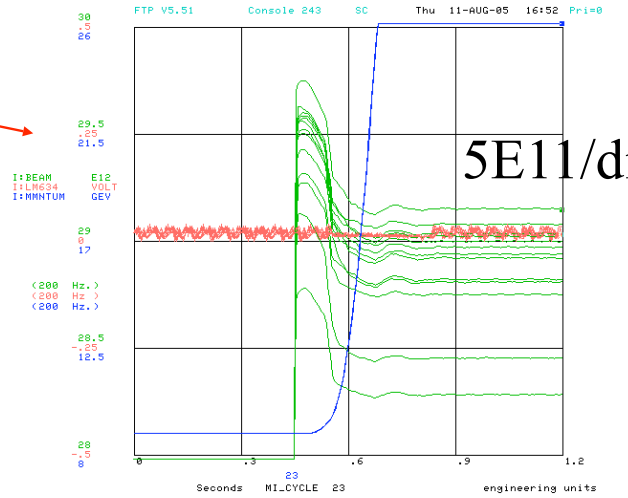


Impact on ring-wide beta function



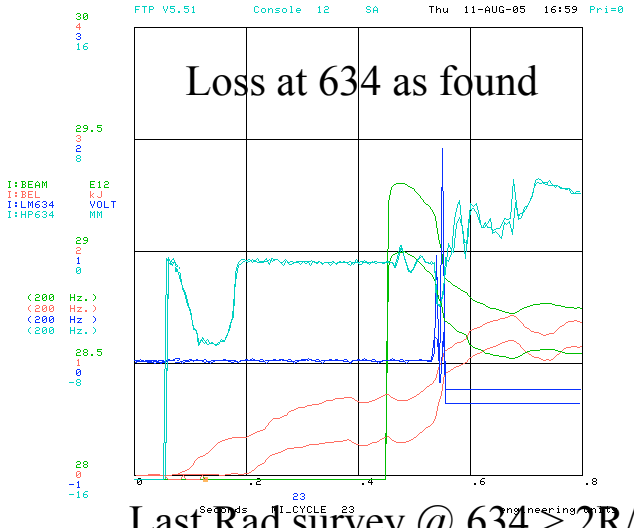
Un-captured beam loss in MI





5E11/div

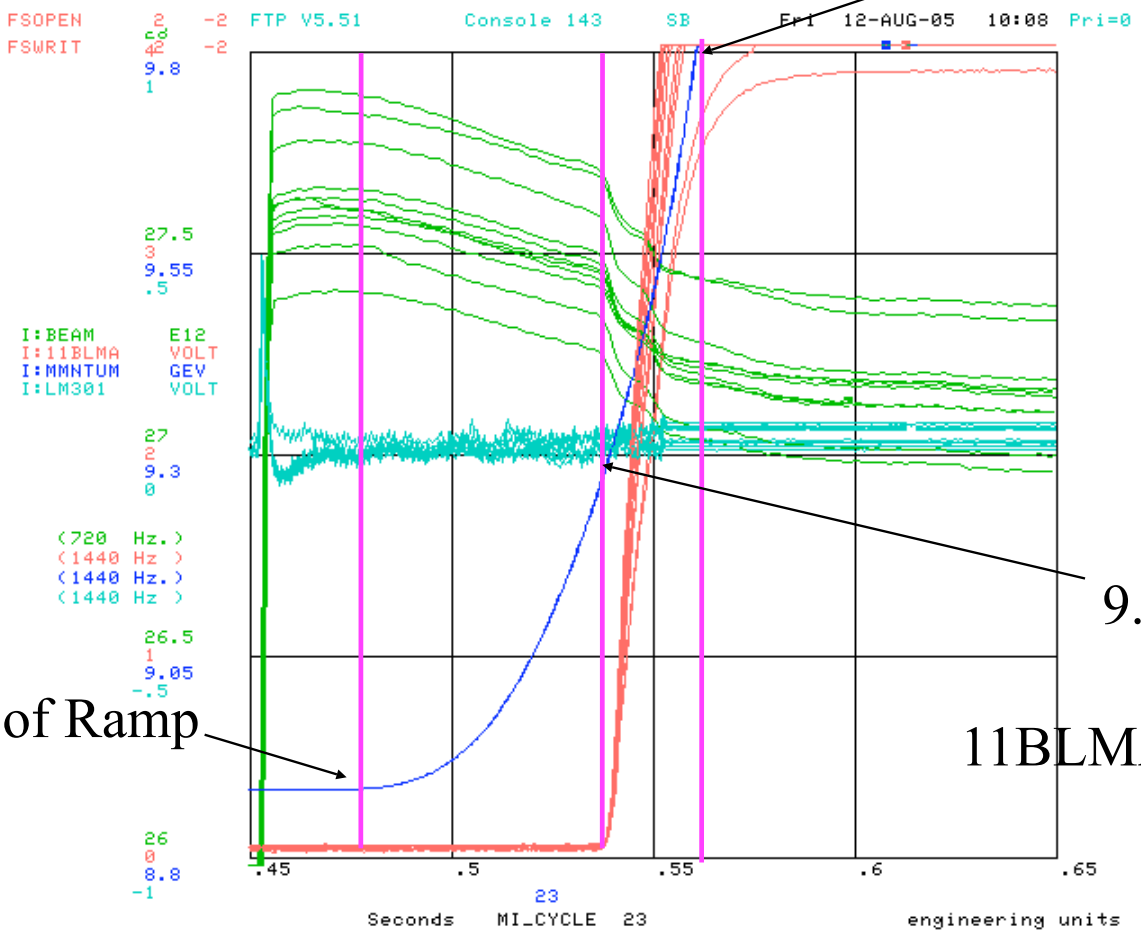
Move orbit outside by ~4 mm
moves loss elsewhere ???



Last Rad survey @ 634 > 2R/hr

Assume 2.2 sec rep rate
5550 hrs/year
5E11 loss/cycle @ acceleration
⇒4.5E18 lost at 9 Gev/year
⇒1992 PSAR limits 1E19/yr @ 8 Gev

MI Beam Loss upon Acceleration



9.8GeV/c

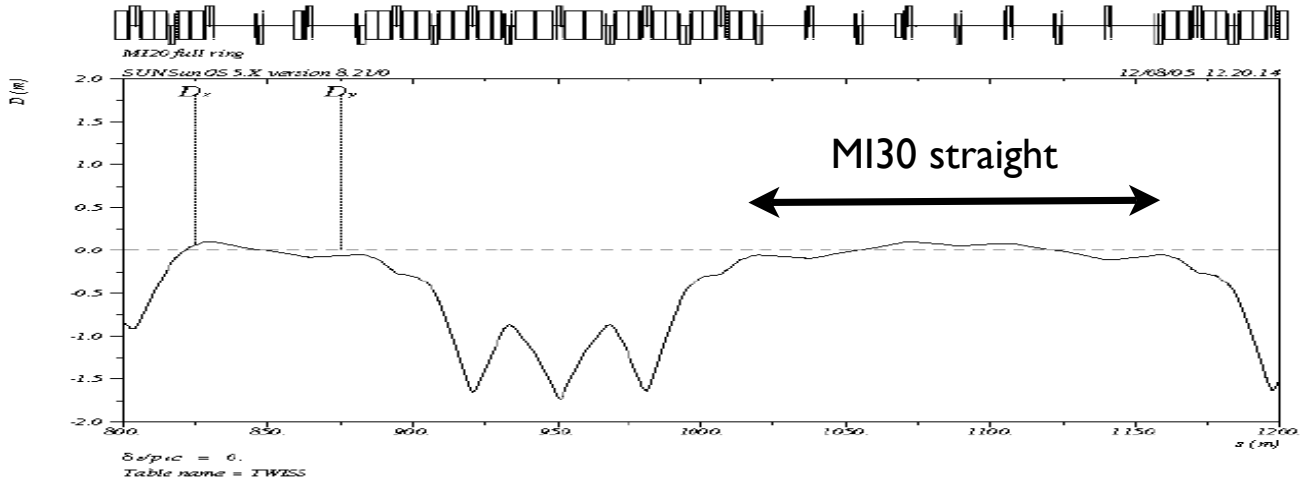
5E11/div

9.28 GeV/c

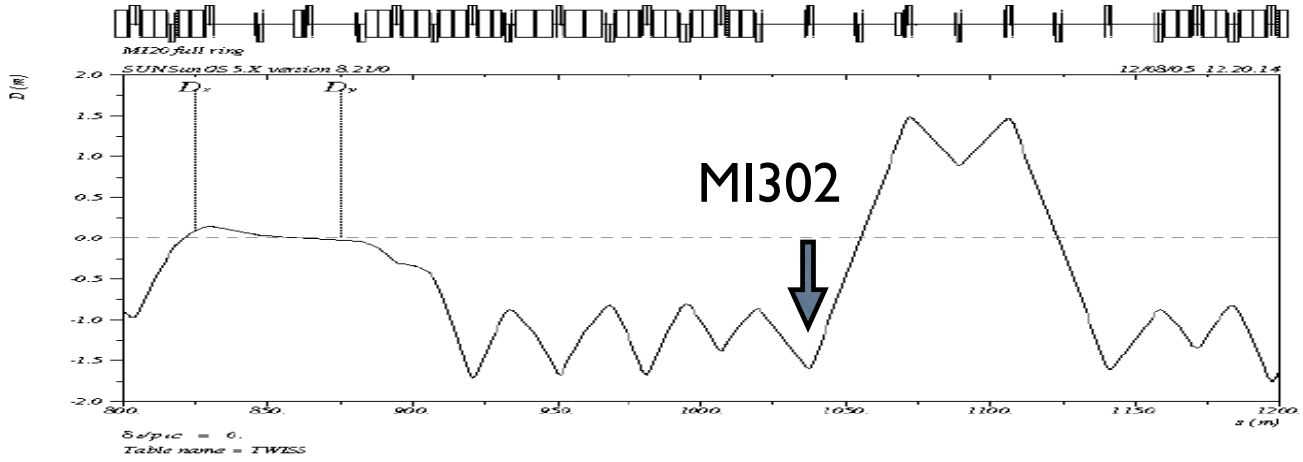
Start of Ramp

11BLMA=LM634

MI-30 Dispersion Un-suppressor for 1.5 m at 302 location



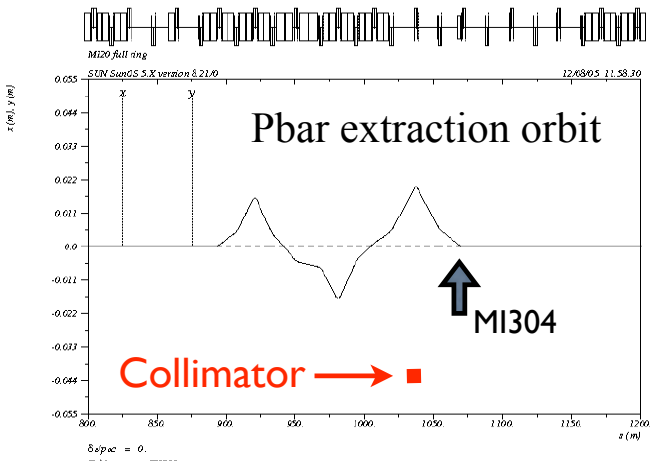
Current dispersion function

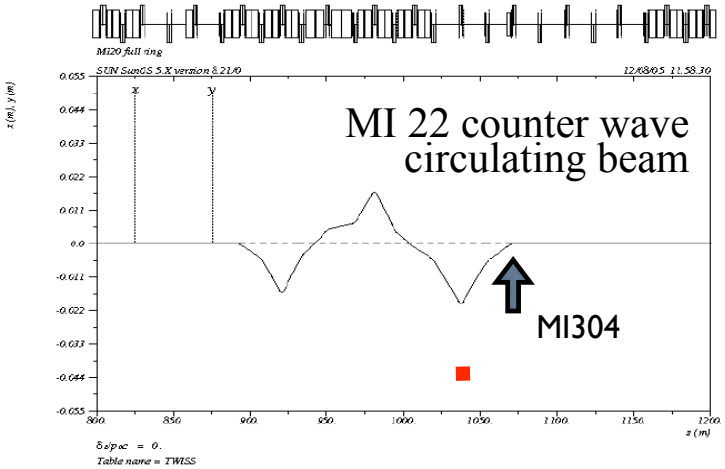


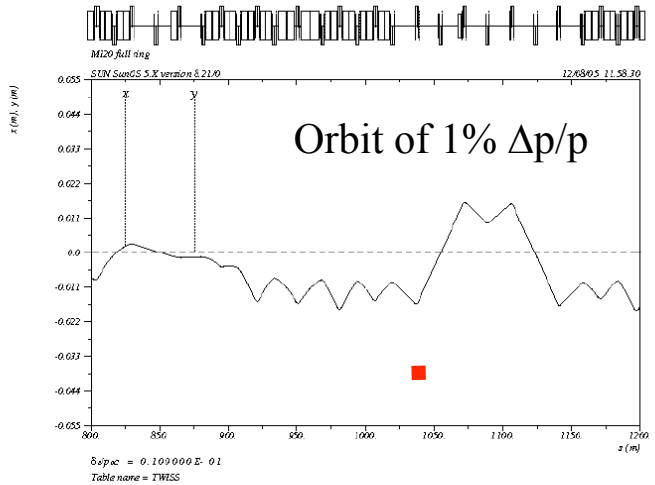
Proposed dispersion function

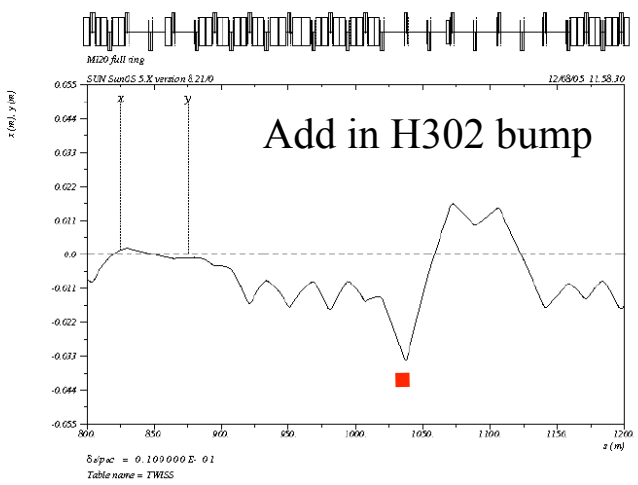
Independent MAD solution with slightly different dispersion function.

Conceptual orbits through MI30









Want collimator to be the limiting momentum aperture
=> Assure this with closed orbit bump

Implementation

- Primary scraper at MI 302
  - Secondary at 304.
- Ramp off
  - Dispersion free.
  - Emittance scraping, horizontal plane.
- Ramp on
  - D.C. beam scraping during acceleration.
  - Momentum scraping with coasting beam.

Work needed

- Evaluate MI momentum aperture
  - Needed to determine the optimal dispersion at MI302.
- Beam loss simulation
- Power supply issue with EE-support
  - Interference with main bus.
- Lattice
  - Fine tune with MAD program.
  - Beam measurements.